



## Reference Specification

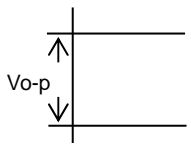
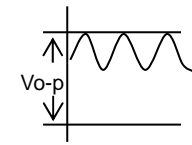
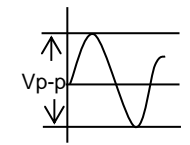
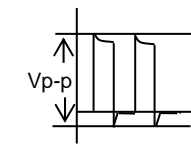
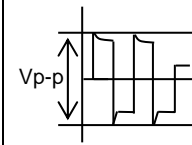
DHR Series  
High Voltage Lead Type Disc Ceramic Capacitors for General Purpose

Product specifications in this catalog are as of Feb. 2018, and are subject to change or obsolescence without notice.  
Please consult the approval sheet before ordering. Please read rating and Cautions first.

**⚠ CAUTION**

**1. OPERATING VOLTAGE**

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the  $V_{p-p}$  value of the applied voltage or the  $V_{o-p}$  which contains DC bias within the rated voltage range. When the voltage is started to apply to the circuit or it is stopped applying, the irregular voltage may be generated for a transit period because of resonance or switching. Be sure to use a capacitor within rated voltage containing these irregular voltage.

Voltage	DC Voltage	DC+AC Voltage	AC Voltage	Pulse Voltage(1)	Pulse Voltage(2)
Positional Measurement					

**2. OPERATING TEMPERATURE AND SELF-GENERATED HEAT**

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high-frequency current, pulse current or the like, it may have the self-generated heat due to dielectric-loss. Applied voltage should be the load such as self-generated heat is within 20 °C on the condition of atmosphere temperature 25 °C. When measuring, use a thermocouple of small thermal capacity-K of  $\phi 0.1$  mm and be in the condition where capacitor is not affected by radiant heat of other components and wind of surroundings.

Excessive heat may lead to deterioration of the capacitor's characteristics and reliability.(Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

**3. OPERATING AND STORAGE ENVIRONMENT**

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. And avoid exposure to moisture. The capacitor is designed to be used in the insulating media, such as epoxy resin, silicone oil, etc.. There must be 3mm or more insulating media for each direction of the capacitor. In case of cleaning, bonding, or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed -10 to 40 °C and 15 to 85. Use capacitors within 6 months after delivered.

**4. BONDING, RESIN MOLDING AND COATING, BOARD TO AVOID**

In case of bonding, molding or coating this product, verify that these processes do not affect the quality of capacitor by testing the performance of the bonded, molded or coated product in the intended equipment.

In case of the amount of applications, dryness / hardening conditions of adhesives and molding resins containing organic solvents (ethyl acetate, methyl ethyl ketone, toluene, etc.) are unsuitable, the outer coating resin of a capacitor is damaged by the organic solvents and it may result, worst case, in a short circuit.

The variation in thickness of adhesive, molding resin or coating may cause a outer coating resin cracking and/or ceramic element cracking of a capacitor in a temperature cycling.

Resin material to hot conditions (over °C 100) was weaker to intensity. So such with board to avoid mechanical stress in this state, please handle it with care.

**5. VIBRATION AND IMPACT**

Do not expose a capacitor or its leads to excessive shock or vibration during use.

## 6. SOLDERING

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.

When soldering capacitor with a soldering iron, it should be performed in following conditions.

Temperature of iron-tip : 400 °C max.

Soldering iron wattage : 50W max.

Soldering time : 3.5s max.

Failure to follow the above cautions may result, worst case, in a short circuit and cause fuming or partial dispersion when the product is used.

## 7. Limitation of Applications

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property.

- |  |                       |                             |
|--|-----------------------|-----------------------------|
| ① Aircraft equipment   | ② Aerospace equipment | ③ Undersea equipment        |
| ④ Power plant control equipment  |                       | ⑤ Medical equipment         |
| ⑥ Transportation equipment(vehicles, trains, ships, etc.)  |                       | ⑦ Traffic signal equipment  |
| ⑧ Disaster prevention / crime prevention equipment   |                       | ⑨ Data-processing equipment |
| ⑩ Application of similar complexity and/or reliability requirements to the applications listed in the above. |                       |                             |

## NOTICE

### Cleaning

To perform ultrasonic cleaning, observe the following conditions.

Rinse bath capacity : Output of 20 watts per liter or less.

Rinsing time : 5min maximum.

Do not vibrate the PCB/PWB directly.

Excessive ultrasonic cleaning may lead to fatigue destruction of the lead wires.

### Capacitance change of capacitor

- Class 1 capacitors  
Capacitance might change a little depending on a surrounding temperature or an applied voltage. Please contact us if you use for the strict time constant circuit.
- Class 2 and 3 capacitors  
Class 2 and 3 capacitors like temperature characteristic B, E and F have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor leaves for a long time.. Moreover, capacitance might change greatly depending on a surrounding temperature or an applied voltage. So, it is not likely to be able to use for the time constant circuit. Please contact us if you need a detail information.

## NOTE

1. Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
2. You are requested not to use our product deviating from this specification.

## Reference only

### 1.Application

This specification is applied to High Voltage Lead Type Disc Ceramic Capacitors DHR series used for General Electric equipment.

Do not use these products in any automotive power train or safety equipment including battery chargers for electric vehicles and plug-in hybrids.

### 2.Rating

#### 2.1 Operating temperature

-25°C to +100°C

#### 2.2 Part number configuration

<u>DHR</u>	<u>B3</u>	<u>4A</u>	<u>102</u>	<u>M</u>	<u>2B</u>	<u>B</u>
Series	Temperature characteristic	Rated voltage	Capacitance	Capacitance tolerance	Lead code	Packing style code

- Temperature characteristic

Code	Temperature characteristic
B3	B

Please confirm detailed specification on [ 5. Specification and test methods].

- Rated voltage

Code	Rated voltage
4A	DC10kV
4B	DC12kV
4C	DC15kV

- Capacitance

The first two digits denote significant figures ; the last digit denotes the multiplier of 10 in pF. ex.) In case of 102.

$$10 \times 10^2 = 1000\text{pF}$$

- Capacitance tolerance

Please refer to [ 4. Part number list ].

- Lead code

Code	Lead style
2B	Straight long
2F	

Please refer to [ 4. Part number list ].

Solder coated copper wire is applied for termination.

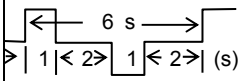
- Packing code

Code	Packing type
B	Bulk type

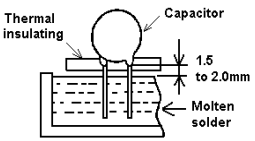


**Reference only**

**5. Specification and test methods**

No.	Item		Specification	Test method														
1	Appearance dimensions		No marked defect on appearance form and dimensions. Please refer to [Part number list].	The capacitor should be inspected by naked eyes for visible evidence of defect. Dimensions should be measured with slide calipers.														
2	Marking		To be easily legible.	The capacitor should be inspected by naked eyes.														
3	Dielectric Strength	Between Lead wires	No failure	The capacitors shall not be damage when DC voltage of 150% of the rated voltage are applied between the lead wires for 60 s in insulate liquid or gas. (Charge/discharge current≤ 50mA.)														
		Body insulation		The capacitors is placed in the container with metal balls of diameter 1mm so that each lead wires, Short-circuited, is kept approximately 2mm off the balls as shown in the figure, and DC voltage of 3kV is applied for 10 s between capacitor lead wires and small metals. (Charge/discharge current≤50mA.)														
4	Insulation Resistance (I.R.)	Between Lead wires	10,000MΩ min.	The insulation resistance shall be measured with DC 1kV within 60±5 s of charging.														
5	Capacitance		Within the specified tolerance.	The capacitance shall be measured at 20°C with 1±0.2kHz and AC5V(r.m.s.) max..														
6	Dissipation Factor (D.F.)		2.5% max.	Same condition as capacitance.														
7	Temperature Characteristic		Within ±10%	The capacitance measurement shall be made at each step specified in table. Capacitance change from the value of step 3 shall not exceed the limit specified.														
					<table border="1"> <tr> <td>Step</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>Temp</td> <td>20±2°C</td> <td>25±2°C</td> <td>20±2°C</td> <td>85±2°C</td> <td>20±2°C</td> </tr> <tr> <td>B</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Step	1	2	3	4	5	Temp	20±2°C	25±2°C	20±2°C	85±2°C	20±2°C	B
Step	1	2	3	4	5													
Temp	20±2°C	25±2°C	20±2°C	85±2°C	20±2°C													
B																		
8	Charge Discharge Test	Appearance	No marked defect.	Charge discharge test shall be measured in the following test circuit and cycle. Applied voltage: rated voltage Cycle numbers: 20,000 cycles Post-treatment: Capacitor shall be stored for 4 h at room condition.														
		Capacitance Change	Within ±10%															
		D.F.	4.0% max.															
		I.R.	5,000MΩ min.															
		Dielectric Strength (Between lead wires)	No failure															
				E: Direct-current Voltage source Co: Supplied energy for Cx. (Co≠10Cx) Cx: Specimen R1: Circuit protective resistor (300kΩ) R2: Current limiting Resistor (E/10Ω)														
9	Strength of Lead	Pull	Lead wire shall not cut off. Capacitor shall not be broken.	Fix the body of capacitor, apply a tensile weight gradually to each lead wire in the radial direction of capacitor up to 10N, and keep it for 10±1 s.														
		Bending	Lead wire shall not cut off.	Each lead wire shall be subjected to 5N weight and then a 90° to bend, at the point of egress, in one direction, return to original position, and then a 90° bend in the opposite direction at the rate of one bend in 2 to 3 s.														

## Reference only

No.	Item	Specification	Test method									
10	Solderability of Leads	Lead wire shall be soldered with uniformly coated on the axial direction over 3/4 of the circumferential direction.	The lead wire shall be dipped into a 25% ethanol solution of rosin and then into molten solder of below temperature for 2±0.5 s. In both cases the depth of dipping is up to about 1.5 to 2.0mm from the root of lead wires. Temp. of solder : Lead Free Solder (Sn-3Ag-0.5Cu) 245±5°C H63 Eutectic Solder 235±5°C									
11	Soldering effect (Non-preheat)	Appearance	No marked defect.									
		Capacitance Change	Within±10%									
		Dielectric Strength (Between lead wires)	No failure									
12	Soldering effect (On-preheat)	Appearance	No marked defect.									
		Capacitance Change	Within±10%									
		Dielectric Strength (Between lead wires)	No failure									
<p>First the capacitor should be stored at 120+0/-5°C for 60+0/-5 s. Then, as in figure, the lead wires should be immersed solder of 260+0/-5°C up to 1.5 to 2.0mm from the root of terminal for 7.5+0/-1 s.</p>  <p>Post-treatment : Capacitor should be stored for 1 to 2 h at room condition.</p>												
13	Humidity (under steady state)	Appearance	No marked defect.									
		Capacitance Change	Within±10%									
		D.F.	4.0% max.									
		I.R.	5000MΩ min.									
		Dielectric Strength (Between lead wires)	No failure									
<p>Set the capacitor for 240±8 h at 40±2°C in 90 to 95% humidity. Post-treatment: Capacitor shall be stored for 1 to 2 h at room condition. (Charge/discharge current: 50mA max.)</p>												
14	Life (high temperature load)	Appearance	No marked defect.									
		Capacitance Change	Within±10%									
		D.F.	4.0% max.									
		I.R.	5000MΩ min.									
		Dielectric Strength (Between lead wires)	No failure									
<p>Apply a DC voltage of 125% of the rated voltage for 1000+48/-0 h in silicon oil at 100±2°C. Post-treatment: Capacitor shall be stored for 24±2 h at room condition. (Charge/discharge current:50mA max.)</p>												
15	Temperature Cycling	Appearance	No marked defect.									
		Capacitance Change	Within±10%									
		D.F.	4.0% max.									
		I.R.	5000MΩ min.									
		Dielectric Strength (Between lead wires)	No failure									
<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Step</th> <th>Temperature(°C)</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-30</td> <td>30 min</td> </tr> <tr> <td>2</td> <td>+100</td> <td>30 min</td> </tr> </tbody> </table> <p>Temperature cycling shall be measured in the following test. Cycle numbers: 5 cycles Post-treatment: Capacitor shall be stored for 4 h at room condition.</p>				Step	Temperature(°C)	Time	1	-30	30 min	2	+100	30 min
Step	Temperature(°C)	Time										
1	-30	30 min										
2	+100	30 min										

Note) Tests for Dielectric strength ,Charging/Discharging test, Humidity , Life and Temperature cycling shall be performed with specimens having molded resin (MR1023C:made by Murata) extending over 3mm on all the surface.

Room condition

Temperature:15~35°C

Humidity:45~75%

Atmospheric pressure:86~106kPa

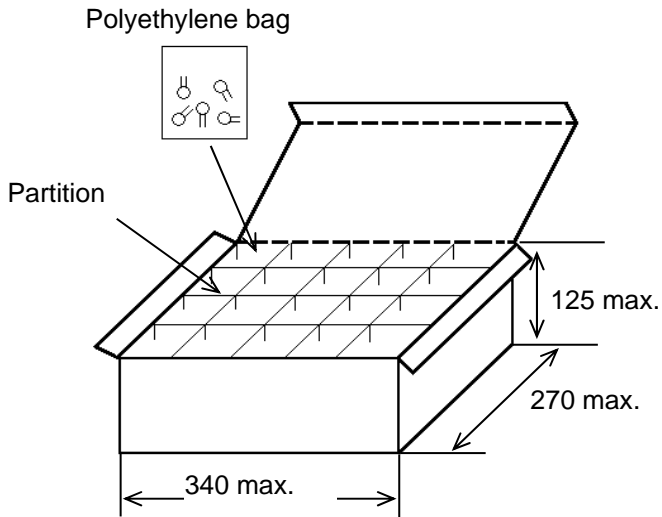
Reference only

6. Packing Specification

Packaging Styles : Bulk type  
(Packing style code : B)

The number of packing = Packing quantity × n<sup>\*1</sup> × n<sup>\*2</sup>

The size of packing case and packing way



\*1 : Please refer to [Part number list].

\*2 : Standard n = 20 (bag)

Note)

The outer package and the number of outer packing be changed by the order getting amount.

Unit : mm



EU RoHS  
RoHS指令への対応

This products of the following crresponds to EU RoHS  
当製品は以下の欧州RoHSに対応しています。

(1) RoHS

EU RoHs 2011/65/EC compliance  
2011/65/EC(改正RoHS指令)に対応

maximum concentration values tolerated by weight in homogeneous materials

- ・1000 ppm maximum Lead
- ・1000 ppm maximum Mercury
- ・100 ppm maximum Cadmium
- ・1000 ppm maximum Hexavalent chromium
- ・1000 ppm maximum Polybrominated biphenyls (PBB)
- ・1000 ppm maximum Polybrominated diphenyl ethers (PBDE)

鉛:1000ppm以下

水銀:1000ppm以下

カドミウム:100ppm以下

六価クロム:1000ppm以下

ポリ臭化ビフェニル(PBB):1000ppm以下

ポリ臭化ジフェニルエーテル(PBDE):1000ppm以下